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Do Resistance Training Exercises Help Improve Symptoms of Depression or Depression Scores?

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ABSTRACT

OBJECTIVE: The objective of this selective EBM review is to determine whether or not resistance training exercises help improve symptoms of depression and/or depression scores.

STUDY DESIGN: Review of three randomized control trials (RTCs), all published from 2009 to present and all written in the English language.

DATA SOURCES: Data sources included peer reviewed articles that were published on PubMed and were selected based on their relevance to the research question and patient outcomes measured.

OUTCOME MEASURED: The clinical outcome of depression symptom improvement with resistance training exercises was measured in these studies using the Center for Epidemiological Studies Depression scale (CES-D) and the Cornell Scale for Depression in Dementia (CSDD).

RESULTS: The study by Chen et al. showed a significant decrease in CSDD scores ($p=0.009$) between the resistance training (RT) and control group. The studies by Sims et al. and LeCheminant et al. showed no significant difference ($P>0.05$) in depression scores between the intervention and control groups.

CONCLUSIONS: Based on the results of the three studies, it appears that RT does not significantly improvement depression symptoms, however further research is needed to determine if there is significant improvement compared to other treatment options.

KEY WORDS: depression, resistance training exercises

INTRODUCTION

Major depressive disorder results in overwhelming feelings of sadness or anhedonia with decreased energy, change in appetite, feelings of guilt, and recurrent thoughts of death for a two-week period. In primary care, depression is one of the most common mental health problems encountered.[1] It is estimated that 17.3 million adults in the United States has at least one major depressive episode in their lifetime.[1] Depressive disorders ranked as the sixth-most-costly health condition overall.[2] In 2013, the cost spent to treat depressive disorders in the United States totaled $71 billion.[2] In 2016, depression was the cause of 8 million healthcare visits per year, with half of those to primary care physicians.[3] Additionally, in 2017, adults ages 18-25 had the highest prevalence to have a major depressive episode.[1] Among the 17.3 million adults in the U.S. who experienced a major depressive episode, in 2017, an estimated 65% of them received combined care with medication and help from a mental health professional.[1] Although the prevalence of depression is high, understanding what leads to a major depressive episode and how to effectively treat each individual is complex.

While the symptoms of depression are easily identifiable, the exact pathophysiology of depression is not well understood. Depressive episodes are believed to be related to a depletion in dopamine, serotonin, epinephrine, and norepinephrine.[4] This theory surrounding neurotransmitter depletion was developed based on the medications that were found to help lessen depressive symptoms in patients. Additionally, there are other factors that increase patients risk of developing depression, these include chronic fatigue, chronic illness, recent cardiovascular event, recent trauma, postpartum, and a family history.[4] Women also have a two times greater risk of developing depression compared to men.[1] Traditionally, medications such as selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants (TCAs), monoamine

oxidase inhibitors (MAOIs), selective norepinephrine reuptake inhibitors (SNRIs), and atypical antidepressants have been utilized for the initial treatment of depression. While these therapies have been effective, they often come with significant side effects including sexual dysfunction, nightmares, weight gain, drowsiness, and increased blood pressure.

Currently, even with the significant side effects, antidepressant medications are the mainstay of treatment for patients with depression, but some patients do not want to take a medication or experience incomplete symptom improvement with mediation alone. While people often associate exercising for its known physical health benefits, new research helps identify the mental health benefits that may accompany the physical benefits of exercise. Resistance and strength training exercises may be an effective alternative option for patients who do not want to use an antidepressant or do not feel they have complete symptom coverage with medication alone. In order to further explore this alternative for treating depression, this systematic review analyzes the effects of resistance training exercises on depression symptoms based on patients self-reported depression scores.

OBJECTIVE

The objective of this selective EBM review is to determine whether or not resistance training exercises help improve symptoms of depression and/or depression scores.

METHODS

This systematic review will examine the effects of resistance training exercises on patients' depression. All articles were published in English in peer-reviewed journals between 2009 and 2017. Keywords used to obtain these articles included: "depression" and "resistance training exercises." The articles were selected from PubMed based on their relevance to the

clinical question, date published, and inclusion of patient-oriented outcomes. A summary of statistics reported includes p-values and NNT.

All three articles are RCTs, included patients 18 years and older who met each study's criteria for depression and were capable of preforming resistance training exercises. Articles were excluded if they were published earlier than 2008, focused on cardio exercises, or involved participants younger than 18. The intervention being reviewed was resistance training exercises. Sims et al. and LeCheminant et al. utilized resistance weight machines for training and Chen et al. used resistance exercise bands.[5,6,7] In LeCheminant et al. the placebo group participated in flexibility exercises, while the placebo groups in Sims et al. and Chen et al. participated in no exercise.[5,6,7] The outcome measured in these studies was the effect of resistance training exercises on depression symptoms and scores. These where measured using the Center for Epidemiological Studies Depression scale (CES-D) and the Cornell Scale for Depression in Dementia (CSDD).[5,6,7]

Table 1. Demographics & Characteristics of included studies

Study	Type	#Pts	Ages	Inclusion Criteria	Exclusion Criteria	w/d	Intervention
Sims et al.[5] (2009)	RCT	45	21-93 years	Stroke patients who were discharged during the previous year	Stroke < 6 months ago, <18, inability to walk ≥20m independently, PHQ-9 score < 5, depression with psychotic features, schizophrenia, alcohol or drug related depression, bipolar, psychiatric diagnoses, suicidal ideation, dementia, terminally ill, uncontrolled HTN, unstable DM, UA	0	Moderate intensity strength exercises using weight machines vs. wait-list control group receiving usual care

LeCh-emin-ant et al.[6] (2012)	RCT	60	21-32 years	6 weeks to 8 months postpartum, >2.27 kg >self-reported pre-pregnancy weight, not planning a pregnancy in subsequent year, non-smoker, able to perform training BID	Inability to perform RT or moderate-intensity exercise, engaging in Rt 2 or more times per week in the last 6 months, or participating in a weight loss program	16	BID resistance training vs. an active comparison group performing BID flexibility training
Chen et al.[7] (2017)	RCT	150	74-88 years	Age ≥65, use of wheelchair for mobility, residence in the facility for at least 3 months, and a dx of dementia from a physician or screening for cognitive impairment	Severe or acute cardiovascular, MSK, or pulmonary illnesses, spinal cord injury with no rehabilitation potential, or training in resistance band exercises	23	Participation resistance band exercises vs. the control group who followed their normal routine

OUTCOMES MEASURED

This review utilized three RCTs and the outcome measured was the reduction in depression symptoms after participating in resistance training exercises. This result was measured using the CES-D in LeCheminant et al. with a score of 16 or greater indicating depression in patients.[6] Sims et al. used the Patient Health Questionnaire (PHQ-9) depression module initially to screen for depression and a confirmatory telephone assessment to ascertain the severity of the depressive symptoms initially and the CES-D to determine the primary outcome of change in depression.[5] In Chen et al. the Cornell Scale for Depression in Dementia (CSDD) was used along with an evaluation of the participants and discussion with participants' primary nurses in the nursing home to assess the initial depression score and change in patients' symptoms.[7] The results were then compared to the control group.

RESULTS

This systematic review, consisting of three RCTs, assessed the ability of resistance training exercises to assist in the improvement of depression symptoms and scores in patients with a baseline score indicative of depression. Sims et al. and LeCheminant et al. utilized resistance weight machines for training and Chen et al. used resistance exercise bands. Table 1 includes all demographics, characteristics, inclusion and exclusion criteria for participants in each study.

In Sims et al., 45 participants were randomized to either the community-based progressive resistance training (PRT) group or a waiting-list comparison group.[5] The median age of participants was 69 years and there were no significant group differences for any of the demographics.[5] The mean baseline CES-D score was 19.3 and PHQ-9 was 10.3, and while all participants met the qualification for depression, those in the comparison wait-list group had higher CES-D and PHQ scores at baseline indicating more severe depression.[5] The PRT program consisted of 10 weeks of training with two sessions of moderate intensity strengthening exercises per week using weight machines.[5] These sessions were held in a community gymnasium with an accredited fitness trainer.[5] The comparison group acted as a wait-list control receiving usual care and were asked not to do any PRT-type exercise.[5] Participants who were on antidepressant therapy continued management under their general practitioner.[5] At the 6-month follow up the PRT group had significantly lower mean scores than the comparison group ($p=0.004$), but the difference was not significant once baseline differences were controlled for ($p=0.36$).[5] A larger portion of the intervention group were in remission/no longer clinically depressed (CES-D<16) at the 6-month follow up, but again the difference was not significant after adjusting for baseline scores ($p=0.23$).[5] Table 2 has the results below. There were no injuries or other adverse events

reported during the study.[5] NNT was calculated with a result of 3. Table 3 has summary of the results below.

Table 2. Depression Outcomes at Six Month Follow-up

	All Subjects	Intervention Group	Control Group	P-value
CES-D (Mean, (SD))	17.93 (10.51)	13.78 (8.02)	22.70 (11.17)	0.36
No longer depressed (CES-D<16) N (%)	20 (46.51%)	15 (65.22%)	5 (25.00%)	0.23

Table 3. Comparison of Benefits between RT and Control group

Experiment Event Rate (EER)	Control Event Rate (CER)	Relative Benefit Increase (RBI)	Absolute Benefit Increase (ABI)	Number Needed to Treat (NNT)
0.6522	0.25	-1.61	-0.402	3

In LeCheminant et al. the effect of resistance training (RT) was studied in 60 healthy women between 6 weeks and 8 months postpartum.[6] Participants were randomized to 18 weeks of RT or flexibility training (FT) exercises twice weekly.[6] Of the 60 initial participants 44 completed the study, 21 completed the RT program and 23 completed the FT program.[6] Patients who withdrew sited different reasons, including injuries not related to the study, worst-case analysis was not completed.[6] Intent-to-treat analysis did not change the significance of the results.[6] There was no difference in the baseline characteristics between the RT and FT groups. The CES-D was used to determine the presence of depressive symptoms in participants, with a score of 16 or greater indicating depression. For the RT group completers, there was a significant decrease in their CES-D score from baseline (9.5 +/- 6.3) to the 4-month follow up (6.4 +/- 4.1) ($p=0.016$).[6] Within the FT group there was no significant change in CES-D score ($p=0.332$).[6] Intent-to-treat analysis revealed that the group x time interaction for CES-D score remained non-significant ($p=0.101$). Table 4 has a summary of these results. During this study, nine of the 44

participants reported mild pain while training, with six of these cases directed at knee pain during leg extension exercises.[6]

Table 4. Clinical Effect on CES-D Score with RT versus FT

	P-Value	CES-D Group x Time Interaction Significance
Resistance Training	0.016	P=0.101
Flexibility Training	0.332	

In Chen et al. the study tested the effects of a 15-month wheelchair-bound resistance band exercise program on depression in wheelchair-bound older adults with dementia.[7] A total of 150 participants were enrolled in the study and were cluster-randomized to two groups, 127 individuals completed the study; 65 patients in the experimental group and 62 patients in the control group.[7] Reasons for withdrawal included death and discharge from the nursing home where the study was being conducted.[7] Among participants, there were no significant differences in their demographic profiles or in the baseline depression scores between the intervention and control groups.[7] The resistance band exercises were conducted as volunteer-led, 40-minute sessions, three times a week for six months.[7] The Chinese version of the Cornell Scale for Depression in Dementia (CSDD) was used to measure depression in participants. Analysis of the trend changes revealed that depression decreased significantly in the experimental group but became more severe in the control group from pre-test to 6-month post-test.[7] After a between-group comparison researchers found by the sixth month, experimental group participants had significantly less depression compared to the control group (p=0.009). Table 5 summarizes the results for the between group comparison. No adverse effects were addressed in this study.

Table 5. Group Comparisons of Depression Scores at Six Month Follow-up

	Experimental Group Mean CSDD	Control Group Mean CSDD	P-value
Baseline	2.9	3.2	0.009
6-month follow-up	2.3	3.2	

DISCUSSION

This systematic review is designed to discuss the efficacy of utilizing RT exercises to decrease patients' symptoms of depression. Exercise is often encouraged in patients to promote physical wellbeing, but its use in mental health is not as readily discussed. Although RT could be an alternative or adjunctive treatment in some patients with depression, caution should be utilized in patients with arthritis, herniated or degenerative discs, cardiomyopathies, or other comorbidities that could be exacerbated by RT exercises.

Additionally, there is a financial advantage to utilizing RT exercise alternative to antidepressants, as patients would not have the same medical costs that are associated with medications. The standard therapy of antidepressant use centers around visiting a doctor, getting a prescription, anticipating the medication's affordability, and manage adverse effects of the medications. While there are new antidepressants on the market that have fewer side effects, these drugs often do not have generics, which can mean a higher cost for patients. In comparison, patient utilizing RT could have the option to use resistance band and exercise at home or obtain a gym membership, which can start at $10.00 a month.

This EBM article review encountered some limitations with identifying and retrieving peer-reviewed articles that discussed the effect of RT exercises on depression. There is a substantial amount of research about aerobic cardio exercise and its effects on mental health, but less research has been completed around RT. Since research is limited, most of the articles in this review had smaller sample sizes which may have limited the results of the studies. For example, LeCheminant et al. notes its primary limitation was the small sample size that resulted from patient dropout rates.[6] Similarly, the Sims et al. study also found their small sample size to be a limitation along with their short follow-up timeline.[5] While there were no significant differences

in baseline demographics between participants the length of time since stroke, onset of depression, severity of stroke, and extent to which they received rehabilitation was different among each patient.[5] If the sample size was larger the study may have been able to account for these differences and balanced these variables between groups. Sims et al. also note that due to their method of recruitment, some recruited participants' depression may have prevented them from responding to the mailed invitation.[5] Additionally, the authors suggest that the six-month follow-up may have been too short of a time period to identify a clinically significant change in depression due to its chronicity.[5] While Chen et al. had the largest sample size of these articles, the authors identified limitations centered predominantly around unequal sample sizes and amount of statistically significant change.[7] While their initial recruitment yielded an equal number of participants between groups, dropout rates decreased the sample size and left an increased number of participants in the experimental group verses the control group.[7] Additionally, while the Chen et al. study found statistically significant change in depression scores on the CSDD after six months, they note the significance was small and therefore should be interpreted cautiously with further research in the RT effect on depression.[7]

CONCLUSIONS

Based on the research conducted in this EBM review, the evidence is inconclusive. While all three studies found an improvement in their RT participants' depression scores, only one study showed a significant difference between groups. Chen et al. was the only study that found a significant decrease in depression when the RT group was compared to the control group. Since the other studies did not find a significant difference between the control and RT groups, further research is needed to determine how effective the use of RT is in comparison to no treatment or treatment with antidepressants. While all of the studies examined the effect of RT

on depression, all subjects had some comorbid condition on top of the depression (post-stroke, postpartum, or wheelchair-bound). Future studies should include a larger population size and address other populations such as those with a diagnosis of major depressive disorder. Further research could yield an opportunity for an alternative or adjunctive treatment therapy of RT for patients with depression.

REFERENCES

1. National Institute of Mental Health. Major depression. National Institute of Mental Health Web site. https://www.nimh.nih.gov/health/statistics/major-depression.shtml. Updated 2019. Accessed September 23, 2019.

2. Winerman L. By the numbers: The cost of treatment. *American Psychological Association*. 2017;48(3):80. https://www.apa.org/monitor/2017/03/numbers.

3. Luthra S. For depression, primary care doctors could be a barrier to treatment. PBS News Hour Web site. https://www.pbs.org/newshour/health/for-depression-primary-care-doctors-could-be-a-barrier-to-treatment. Updated 2016. Accessed September 28, 2019.

4. Mayo Clinic. Major depressive disorder. Mayo Clinic Web site. https://www.mayoclinic.org/diseases-conditions/depression/symptoms-causes/syc-20356007. Updated 2018. Accessed October 1, 2019.

5. Sims J, Galea M, Taylor N, et al. Regenerate: Assessing the feasibility of a strength-training program to enhance the physical and mental health of chronic post stroke patients with depression. *International journal of geriatric psychiatry*. 2009;24(1):76-83. https://www.cochranelibrary.com/central/doi/10.1002/central/CN-00702188/full. doi.org/10.1002/gps.2082.

6. LeCheminant JD, Hinman T, Pratt KB, et al. Effect of resistance training on body composition, self-efficacy, depression, and activity in postpartum women. *Scandinavian journal of medicine & science in sports*. 2014;24(2):414-421. https://www.cochranelibrary.com/central/doi/10.1002/central/CN-01021829/full. Doi:10.1111/j.1600-0838.2012.01490.x.

7. Chen KM, Kuo CC, Chang YH, Huang HT, Cheng YY. Resistance band exercises reduce depression and behavioral problems of wheelchair-bound older adults with dementia: A cluster-randomized controlled trial. *J Am Geriatr Soc*. 2017;65(2):356-363. doi: 10.1111/jgs.14526.